No. 12

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INSTITUTE

PROCEEDINGS

of

The Canadian Phytopathological Society

ELEVENTH SESSION

June 26-28, 1944

TORONTO, ONT.

EDITORIAL COMMITTEE

R. S. WILLISON

M. W. CORMACK R. E. FITZPATRICK

WINNIPEG, CANADA

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The Canadian Phytopathological Society

List of Officers and Council

1943-1944

President

F. J. GREANEY, Dominion Laboratory of Plant Pathology,
Winnipeg, Man.

Vice-President

T. C. VANTERPOOL, University of Saskatchewan,
Saskatoon, Sask,

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T. JOHNSON, Dominion Laboratory of Plant Pathology,
Winnipeg, Man.

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W. C. BROADFOOT, Dominion Laboratory of Plant Pathology,
Edmonton, Alta.

J. F. HOCKEY, Dominion Laboratory of Plant Pathology,
Kentville, N.S.

The five months following the end of the year covered by this Proceedings saw the passing of two of the most distinguished members of the Canadian Phytopathological Society. As their deaths occurred so soon after the end of the Society's current year, it seemed appropriate to include brief obituaries in the present Proceedings rather than to defer their appearance for another year.

Arthur Henry Reginald Buller,

Ph.D., D.Sc., F.R.S.

1874 — 1944

Dr. Buller's death, on July 3, 1944, deprived the Canadian Phytopathological Society of one of its most distinguished members and Canada of one of her most noted scientists.

Dr. Buller was born in Birmingham, England, on August 19, 1874. After an extensive academic training in the natural sciences, for which he was awarded the degrees of B.Sc. (London), Ph.D. (Leipzig), and D.Sc. (Birmingham), he was, in 1904, appointed to the chair of botany at the University of Manitoba, a chair he filled until 1936, when he was appointed Professor Emeritus.

Few men have devoted themselves as wholeheartedly to the interests of science as did Dr. Buller; and it is fitting that the scientific world should have rewarded his efforts with numerous honours. His devotion to science was not solely of the kind that finds its full satisfaction in seeking after truth. He always had the courage of his convictions, together with a combativeness that led him frequently to fight for the ideas he believed in whenever and wherever they came under attack.

Dr. Buller was a brilliant and inspiring teacher and lecturer and will be remembered as such by the present generation of Canadian botanists and plant pathologists. But his reputation of the future will rest on his published researches. His monumental "Researches on Fungi," six volumes of which have already been published, brought him world-wide recognition.

He should, however, be remembered for other contributions as well. Along with Dr. C. L. Shear he edited W. B. Grove's three-volume translation into English of Tulasne's "Selecta Fungorum Carpologia." His share in the compilation of "The Fungi of Manitoba" (1929), and "The Fungi of Manitoba and Saskatchewan" (1938), bears enduring testimony to his keen interest in the taxonomy of the fungi, while his interests in the promotion of agriculture are equally testified by his "Essays on Wheat" (MacMillans, 1919).

Among the many honours bestowed on Dr. Buller may be mentioned: The honorary degree of LL.D., University of Manitoba, 1924, University of Saskatchewan, 1928; the honorary degree of D.Sc., University of Pennsylvania, 1933; presidency of the Royal Society of Canada, 1927-28; fellowship of the Royal Society of London, 1929; the Flavelle Medal of the Royal Society of Canada, 1929; and the Royal Medal of the Royal Society of London, 1937.

Dr. Buller was a man of broad culture who delighted in poetry, art, and music; and he was, himself, a pianist of no mean accomplishment. To Canadian plant pathology he was a sincere friend who will not soon be forgotten.

Herbert Hice Whetzel

B.A., M.A., D.Sc.

1877 — 1944

With the passing of Dr. Whetzel on November 30, 1944, phytopathology has lost one whom the future will place in the first rank of those who established that discipline as a distinct branch of biological science. It is, indeed, doubtful if any other man played a more important part than he did in acquiring for it this recognition.

Dr. Whetzel was born near Avilla, Indiana, on September 5, 1877. He received his B.A. degree from Wabash College in 1902, and became Assistant in Botany to Professor G. F. Atkinson at Cornell University in the same year. From that time on, his career was inseparably associated with the development of the Department of Plant Pathology in that University. In 1907, he became Assistant Professor and Head of the newly established Department of Plant Pathology and, in 1909, was appointed full Professor—the first occupant of a chair of plant pathology at an American University. The years from 1907 to 1922, during which he remained Head of the Department, proved to be of the highest importance to phytopathology on this continent, for it was during this period that it gained acceptance as a separate field of science.

Dr. Whetzel had qualities that fitted him admirably for the task of building up a great department of plant pathology. He was deeply conscious of the necessity for and the practicability of plant disease control, which in those early days was but little realized by most botanists and scarcely at all by the public; and he lost no opportunity of impressing this consciousness not only on his students but also on growers and on industrial and business concerns connected with agriculture. His enthusiasm infected alike his students and those from whom he sought financial support for his projects. Combined with a singleness of purpose so effective in gaining his objectives he possessed a versatility of interest that found expression in the most diverse aspects of mycology and plant pathology. His interest in the control of plant diseases led to research on the development of lime sulphur as a fungicide for the spraying of fruit; to the development of dusting as a substitute for spraying; and to the inauguration of organized potato inspection and the production of disease-free seed potatoes. His "Manual of Fruit Diseases," published jointly with L. R. Hesler, is another result of his interest in practical plant pathology. But his devotion to the practical problems of pathology found its counterpart in his keen interest in the taxonomy of the fungi, from which derive his notable contributions to our knowledge of the Discomycetous fungi and his surveys of the fungi of Porto Rico and Bermuda. His "History of Phytopathology" (1918), and his labours in the editing of "Phytopathological Classics" bear witness to his strong attraction to the history of the science to which he devoted his life.

Dr. Whetzel was a member of numerous scientific societies and served as President of the American Phytopathological Society (1915) and the Mycological Society of America (1939). He was honoured by his Alma Mater, Wabash College, with the degrees of M.A. (1906) and D.Sc. (1931), and by the University of Porto Rico with the degree of D.Sc. (1926). In Canada, his many students and other friends will keep his memory alive for many years to come.

MINUTES OF THE ELEVENTH ANNUAL MEETING HELD AT HART HOUSE, UNIVERSITY OF TORONTO, TORONTO, ONT., JUNE 26 TO 28, 1944

BUSINESS SESSIONS

The meetings opened with a preliminary business session called to order by the President, F. J. Greaney, at 1:45 p.m., June 26, with 31 members of the Society in attendance.

Convention committees were nominated from the chair as follows: Resolutions Committee—F. L. Drayton, D. L. Bailey, W. Newton. Publicity Committee—L. W. Koch, G. C. Chamberlain, H. W. Mead. Nominations Committee—T. C. Vanterpool, A. A. Hildebrand, J. F. Hockey.

The minutes of the 1940 meeting were accepted as read on a motion by I. L. Conners, seconded by J. F. Hockey.

The following communication from the Dominion Botanist, Dr. H. T. Gussow, to the President was read by the Secretary-Treasurer:

Division of Botany and Plant Pathology,
Central Experimental Farm,
Ottawa, Ontario,
May 20, 1944.

To: DR. F. J. GREANEY, President,
Canadian Phytopathological Society,
Winnipeg, Manitoba.

Dear Dr. Greaney:

I am indeed very sorry that I shall be unable, for official reasons, to attend the meeting of the Canadian Phytopathological Society. I looked forward to doing so and bidding a personal farewell to my professional colleagues and friends, but my attendance at the Saskatoon meeting of the Canadian Seed Growers' Association has become even more necessary since Mr. Scott is ill, and is not allowed to travel.

Would you be good enough to convey my regrets to the Society and say that I wish it and the members every prosperity and good wish, and that I hope they will not ever "give up the ship" whatever difficult times they may have to face as a society now or in the future. Times cannot be worse than they are now and there is every prospect of better times around the corner.

With kindest personal greetings to members of the Society.

I am,

Faithfully yours,

H. T. GUSSOW.

The report of the Secretary-Treasurer was read and approved on a motion by H. N. Racicot, seconded by I. L. Conners.

The President then called for the reports of the standing committees. The report of the Common Names Committee was read by I. L. Conners and was approved on a motion by Mr. Conners, seconded by L. W. Koch. The report of the War Emergency Committee, read by F. J. Greaney, was approved following a motion by F. J. Greaney, seconded by F. L. Drayton.

The President asked the meeting if it was the wish of the members present to maintain the regional organizatons set up by the War Emergency Committee in 1941. W. Newton spoke briefly in favour of continuing the regional organization. Moved by T. C. Vanterpool and seconded by W. Newton that the regional organization be continued. Carried.

The meeting was then turned over to the Symposium on Extension Work in Plant Pathology.

A concluding business session was called to order by the President at 9:10 a.m., June 28.

The report of the Nominations Committee was presented by T. C. Vanterpool. The recommendation was made that the Common Names Committee and the Editorial Committee be continued; but that the Committee on the Imperial Mycological Institute be discontinued, and that any future matters arising between the Institute and the Canadian Phytopathological Society be handled by the Executive. The Nominations Committee further recommended that two new committees be appointed to act for one year, namely, a Committee on Constitution and By-Laws and a Committee on Membership. The personnel of these committees is as follows: Common Names Committee: I. L. Conners (Chairman), G. H. Berkeley, W. L. Gordon, J. W. Groves, Emile Jacques, and Irene Mounce. Editorial Committee: R. S. Willison, M. W. Cormack and R. E. Fitzpatrick. Constitution and By-Laws: D. L. Bailey (Chairman), A. W. Henry, and T. Johnson. Membership: Regional Representatives (Chairman to be appointed by the Council of the Society).

The report of the Resolutions Committee was read by F. L. Drayton and approved on a motion by F. L. Drayton, seconded by L. E. Tyner.

The report of the Convention Publicity Committee, presented by L. W. Koch, stated that contacts had been made with the publicity committee of the C.S.T.A. The report was approved on a motion by L. W. Koch, seconded by H. W. Mead.

The President placed before the meeting a recommendation by the Council that the Society should recognize the long and distinguished service of Dr. H. T. Gussow to phytopathology in Canada by making him an honorary member. A motion to this effect was made by J. F. Hockey, seconded by D. L. Bailey and approved.

It was moved by I. L. Conners and seconded by H. N. Racicot and approved that W. L. Gordon and F. J. Greaney be appointed auditors for the year 1944-45.

It was moved by J. F. Hockey and seconded by W. Newton that an honorarium of $15.00 be paid to Miss A. S. Karp for stenographic services performed during the year 1943-44.

A brief discussion took place on the desirability of passing on to extension workers in plant pathology information contained in certain of the papers presented to the symposium sessions. It was moved by I. L. Conners and seconded by F. L. Drayton and approved that the task of selecting the papers that would be of greatest value to extension workers, and of preparing, mimeographing, and distributing these papers be placed in the hands of the retiring Executive in consultation with Dr. R. J. Haskell and the leaders of the symposia.

The names of T. B. Lott and J. T. Slykhuis were proposed for membership and approved following a motion by I. L. Conners, seconded by W. Newton. The names of R. O. Lachance, A. Payette, and H. Genereux were proposed for membership and approved following a motion by J. C. Perrault, seconded by F. L. Drayton; and the name of R. A. Ludwig was proposed and approved following a motion by L. E . Tyner, seconded by J. C. Perrault.

REPORTS OF STANDING COMMITTEES

REPORT OF THE COMMON NAMES COMMITTEE

I beg to report progress in the preparation of a supplement to the Check List. On October 28, 1943, I sent a typescript of the proposed supplement to the members of the Committee and to most of the Dominion Laboratories. I had an excellent response from everyone. Dr. Berkeley very kindly went over the virus diseases and suggested a complete revision of the diseases. As there were a large number of reports in the Plant Disease Survey, the status of which had apparently been left in abeyance by Dr. Crowell, I began a complete compilation of all reports of virus diseases appearing in the Survey reports. However, before I was able to complete this record for scrutiny of our members interested in virus diseases, particularly Dr. Berkeley, I had to put the revision aside to work on the next annual Report of the Plant Disease Survey. I hope I shall be able to complete the Supplement ahead of the 1944 Report.

Respectfully submitted,

I. L. CONNERS, Chairman.

REPORT OF THE WAR EMERGENCY COMMITTEE

During the year 1943-44, the Committee continued its activities, but, apart from the function of keeping members of the Society in touch with the wartime problems and developments in Canada and the United States, most of the work was done by the various regional committees. The Chairman has attempted to facilitate the work of the regional committees as much as possible.

In 1943-44, regional meetings of members of the Society were held in the Maritime Provinces, Eastern Ontario, Western Ontario, Manitoba, Saskatchewan, and Alberta. These meetings provided an opportunity for plant pathologists to discuss their local problems, and to consider problems of national importance to the war effort. As a result of such meetings, the Council of the Society received valuable suggestions in respect to such problems as the establishment of a more adequate extension service in plant pathology in Canada, the expansion of plant disease survey work, and the estimation of plant disease losses. These suggestions were considered by the Council, and wherever possible, acted upon.

On no problem is there greater unanimity of opinion among plant pathologists than in respect to the urgent need of a more adequate extension service in plant pathology in Canada. A resolution on this subject, embodying most of the recommendations of the regional committees, was prepared by the Chairman, and submitted, with the approval of the Council, to the appropriate federal authorities. This resolution is now under consideration by officials of the Department of Agriculture, Ottawa.

During the year the Committee was active in investigating the desirability and possibility of obtaining federal action in regard to an expansion of the plant disease survey in Canada. The object of the Committee was to work towards a more adequate survey, and a more reliable evaluation of losses due to plant diseases. The outlook for an expansion of plant disease survey work in Canada is promising.

Recently, various regional committees have viewed with considerable alarm the continued spread of bacterial ring rot of potatoes in this country, and have suggested firm measures for its eradication and control. The views of regional groups of plant pathologists on the matter were brought to the attention of the Chief, Plant Protection Division, and to the Dominion Botanist, Science Service, Ottawa. The Chairman accepted the responsibility of offering the services of the Committee to the Plant Protection Division in its effort to check the spread of bacterial ring rot in Canada, and in facilitating closer co-operation between the varied services and interests in this country that are concerned with its eradication and control.

Your Chairman has worked in close co-operation with the Pesticides Requirements Committee of the Wartime Prices and Trade Board, and advised Mr. G. F. Manson, Secretary of this special committee, on matters pertaining to pesticides and plant disease control.

During the year the Committee has been in the closest touch with the activities of the national, regional, and special committees of the War Committee, American Phytogathological Society, and has facilitated the dissemination to Canadian plant pathologists of the latest information on new developments and trends in plant disease control in the United States.

In conclusion, may I express my personal appreciation to members of the Council, and more particularly to the regional representatives of the Committee, for their enthusiastic work. As Chairman of the Committee I have tried to put their suggestions and recommendations into effect. Through their support and help the War Emergency Committee was able, in spite of many difficulties, to perform effective and useful work.

F. J. GREANEY, Chairman.

REPORT OF THE SECRETARY-TREASURER

Mr. President:

I beg to submit, herewith, the report of the Secretary-Treasurer for the year ending May 31, 1944.

This is the eleventh annual meeting of the Canadian Phytopathological Society. The last annual meeting was held four years ago at Winnipeg, Man., June 20 to 22, 1940. It consisted of four sessions: A business session; a session comprising invitation papers by Dr. E. C. Stakman and Prof. A. H. R. Buller; a session devoted to the presentation of scientific papers; and a session consisting of a discussion on seed treatment problems. Abstracts of the papers presented and other details of the meeting are printed in the tenth Proceedings of the Canadian Phytopathological Society.

In the four-year interval between the last meeting and the present one, the affairs of the Society have of necessity been conducted by the Council. The organization of the Society, in 1941, into eight regional groups, however, represents an attempt by the Council to keep the membership-at-large functioning as a Society even in the absence of annual meetings.

To summarize the activities of the regional groups and to put on record financial statements and other matters, the present Council undertook the preparation and printing of the eleventh Proceedings of the Society which has recently been forwarded to members. In this Proceedings are to be found the financial statements for the years 1940-41, 1941-42, and 1942-43, as well as a brief report by the Secretary-Treasurer on the election of officers, membership, and the enlistment of members in the armed forces.

During this period the Society, at the request of the Chairman of the Common Names Committee, gave financial assistance towards the publication of the "Check List of Diseases of Economic Plants in Canada." This publication was distributed to all members in 1943.

Election of Officers

Nomination ballots were sent out in March to be returned on or before April 8th. A total of 36 ballots were returned. As a result the following members were nominated: D.J.MacLeod, Donald Reddick, and T. C. Vanterpool for President; W. C. Broadfoot, A. W. Henry, and L. W. Koch for Vice-President; and J. C. Perrault, P. M. Simmonds, and R. S. Willison for Councillor.

Electoral ballots were sent out at the middle of April to be returned on or before May 1. Forty-six ballots were returned, resulting in the election of T. C. Vanterpool as President, L. W. Koch as Vice-President, and J. C. Perrault as Councillor. Margaret Newton, F. J. Greaney, and W. L. Gordon acted as scrutineers.

Membership

The membership has changed very little during the past four years. On May 31st, 1944, the paid-up membership was 71 as against a paid-up membership of 72 for the previous year, and of 73 on May 31st, 1940. At the end of the past year it was necessary to remove four names from the list of members on account of non-payment of fees. During the same year two new members were added to the list and one former member was re-instated.

Finances

As shown by the attached financial statement, the revenue for the year 1943-44 was $100.89. Expenditure was $164.41, of which the chief items were the printing of Proceedings No. 11 ($98.55) and an order of stationery ($38.56). The net balance at the end of the end of the year $103.92. To this, however, should be added the $500.00 Victory Bond purchased with funds of the Society in 1942.

The Eleventh (Toronto) Meeting

The President appointed L. W. Koch to act as Chairman of a local committee to work out the final details of the programme of the Society and to integrate it with the programme of the C.S.T.A.

Respectfully submitted,

T. JOHNSON, Secretary-Treasurer.

FINANCIAL STATEMENT

1943 - 1944

REVENUE:

Balance forward			$167.44
Fees: 1942-43	$ 4.00		
1943-44	64.58		
1944-45	5.00		
		$ 73.58	
Sale of Proceedings		10.25	
Bank Interest		.89	
Premium on U.S. Currency		1.17	
Interest on Bond		15.00	
		$100.89	$268.33

EXPENDITURE:

Printing of Proceedings No. 11	$ 98.55	
Stationery	38.56	
Stamps	18.00	
Flowers for Funeral of Prof. W. P. Fraser	8.00	
Bank Exchange	1.30	
	$164.41	
Balance (in bank and cash on hand) May 31, 1944		$103.92

ADDITIONAL ASSET:

Dominion of Canada 3% Victory Bond due 1954	$500.00

Audited and found correct,

(Signed) H. N. RACICOT

I. L. CONNERS

June 8, 1944

SYMPOSIUM ON EXTENSION WORK IN PLANT PATHOLOGY

Chairman: F. J. GREANEY

Leader of Discussion: I. L. CONNERS

The meeting was opened by a brief introductory talk by the Chairman, after which he called on the invitation speaker, Dr. R. J. Haskell, to present his address.

EXTENSION WORK IN PLANT PATHOLOGY IN THE UNITED STATES

DR. R. J. HASKELL

Summary of Talk Given Before the Symposium on Extension Work in Plant Pathology, June 26, 1944

Dr. Haskell devoted the opening of his talk to an outline of the organization for extension work in the United States, which had its beginning in agricultural societies and farmers' institutes and was later taken up by certain colleges of agriculture. Although the federal government had shown some interest in extension work from 1887 onwards, it was not until the passing of the Smith Lever Act, in 1914, that extension work was organized in its present form. This act provided for extension services to be conducted co-operatively by the colleges in the several States and the U.S. Department of Agriculture.

As now organized, each state has its own extension service with the necessary directors, state leaders and subject-matter specialists with headquarters at the state college. Each county has its agricultural agents, and recently there have been added voluntary neighborhood leaders to co-operate with county agents in taking emergency information to farmers. The federal office, in Washington, is modelled somewhat on those of the states. It has its directors and leaders in work with farmers; its information, editorial, and visual aids services; its division for studying methods; and its group of subject-matter specialists. The federal workers are paid from U.S. Government funds, state workers from state and federal funds, and county agents from county, state, and federal funds.

When a state decides to establish an extension service in plant pathology, a project agreement setting forth the need for the work, the broad objectives, organization, methods of procedure and working arrangments, is drawn up between the state college and the U.S. Department of Agriculture. The funds are allocated and the specialist employed. At the beginning of each year he makes out his annual plan of work, outlining what he intends to do and how he proposes to do it. After this plan is approved by the state and by Washington, funds are provided and the work proceeds.

Extension work in plant disease control is now being conducted in 22 states, employing 36 full or part-time specialists. Some devote their full time to extension work; some devote part time to teaching or research work. In one state that has no formal extension project in plant pathology, the experiment station allows its men to travel freely to do advisory and extension work with agents and farmers, each man devoting himself to the crops and diseases that come in his special field. In some states the specialist is both pathologist and entomologist. It is difficult, however, to find qualified "dual-purpose" men who will give adequate attention to both insect and plant disease control.

The state extension pathologist keeps in mind that the county agents are the leaders of his organization in the counties and so he works closely with and through them. One of his most important jobs is to teach and inform the agents as thoroughly as possible. His work includes publicity, radio, contacting state-wide organizations, etc., but contact with farm people is mostly through the agents.*

*Extension methods are dealt with in U.S.D.A. Extension Service Cir. 411, Manual of Extension Methods in Plant Pathology.

In much the same way that state specialists assist county agents, the federal pathologist supports the work of the state extension men, his principal function being to assist the state specialists in all possible ways. He consults with them and with the state directors regarding selection of their major undertakings and goes over their plans. He makes suggestions regarding methods and teaching devices that may be useful. He brings to the states the results of new research that may be useful in the solution of problems. He keeps state specialists informed of changes in supplies of materials due to war restrictions and war requirements. He encourages the preparation of popular bulletins, leaflets, articles, and press releases. He acts in a liaison capacity between the Bureau of Plant Industry, Soils, and Agricultural Engineering and the Federal Extension Service, not only taking new research information to the Extension Service, but also bringing to the attention of the Bureau problems in need of more research. He also serves states having no extension project in plant pathology by making contacts with horticulturists, agronomists, and departments of plant pathology. Very few, if any, projects are developed in Washington and handed down from there but stimulus is given whenever occasion demands.

Dr. Haskell's talk was followed by a survey by Mr. I. L. Conners of the present status of extension work in plant pathology in Canada. The deficiencies of the present organization were outlined and certain suggestions were made for the improvement of the service. The meeting was then thrown open to general discussion to which several members contributed.

SYMPOSIUM ON BACTERIAL RING ROT OF POTATOES

PRESENT STATUS OF BACTERIAL RING ROT IN CANADA

(Compiled by H. N. Racicot from reports and brought up-to-date to Jan. 1, 1945)

Chairman: J. F. HOCKEY

Leader of Discussion: H. N. RACICOT

Bacterial ring rot was first found in the province of Quebec in 1931 and immediately named "bacterial wilt or blight," although the cause was not actually known (1, 2). Suspected cases were observed in New Brunswick in 1934 (2) and 1935 (3), but it was only in 1937 (4) that it was definitely recognized as ring rot. It was also found in 1937 in stored tubers in Alberta (5). In 1938, it was found for the first time in Prince Edward Island, Ontario, Manitoba, and Saskatchewan (5). One case was found in Nova Scotia in 1939 (6), and two cases in 1942 (7). In British Columbia, two cases were found in 1942 (7) and two in 1943 (8).

There exist no accurate figures on the prevalence of ring rot in Canada, as no adequate country-wide survey has ever been made. It is only in a few provinces that a fairly accurate idea of the prevalence of ring rot can be formed. For instance, in Prince Edward Island, a pretty close watch has been kept on ring rot. The number of cases found, 1938 to 1943 inclusive, was 7, 13, 25, 2, 1, 1. In 1944, however, 65 cases were found as the result of an intensive survey. It is quite general in table stock potatoes in New Brunswick, Quebec and Manitoba. Ontario and Saskatchewan probably have a scattering of ring rot throughout most parts. In Alberta the disease is present mainly in the Lethbridge area which is probably he chief potato growing district in that province. Nova Scotia and British Columbia are, possibly now free from ring rot.

Life History and Dissemination of Bacterial Ring Rot. Bacterial ring rot is caused by **Corynebacterium sepedonicum** (Spieck. & Kotth.) Skapt. & Burkh. (9, 10). The bacteria overwinter mainly in slightly infected tubers. They may also overwinter on contaminated bags and bin walls and on the surface of potatoes smeared over by adjacent decaying ring rot tubers. It does not overwinter in the soil, although it may overwinter in tubers that survive all winter in the ground. The percentage infection in potatoes on a farm increases rapidly because of the spread by the knife used in cutting sets and by the planter, particularly the picker type of planter. It is spread

locally from farm to farm by the exchange of potatoes for seed and the exchange of machinery between neighbours. The use of contaminated second-hand bags as containers for seed potatoes and cut sets may also introduce the disease on a farm. It is spread, from one part of the country to another largely by means of infected potatoes used for seed. This occurs mainly when people buy table stock potatoes for planting. However, there is no doubt that before the cause and seriousness of the disease was known and a "no tolerance" standard adopted, it became widely distributed through certified seed potatoes.

Control of Ring Rot. In may be impossible to select exclusively healthy tubers from potatoes that have ring rot, no matter how little, as a number of infected tubers will show no symptoms even in the spring, and yet they will contain sufficient bacteria not only to produce diseased plants, but to contaminate the knife and the planter. Seed treatments, even of cut sets, may reduce the amount of ring rot that otherwise would occur, but will not control it. Therefore, the only practical control measures are (1) the elimination of the disease on the farms where it exists, and (2) the prevention of its introduction on a farm or in a district where it is not present.

To eradicate the disease, all the potatoes without exception on the affected farm should be disposed of. If sold for table use, they should be marketed at such a time and place that they are not likely to find their way to another farm and be planted there. The storages, machinery, tools, bags, etc., should all be thoroughly cleaned and disinfected. Then ring rot free seed should be purchased for planting the next season.

To prevent the introduction of the disease on a farm or in a new area, nothing but fully certified seed potatoes should be purchased, and all used bags brought on a farm should be disinfected. Prohibiting the movement of infected table stock potatoes in the spring, except as directed, when many people buy table stock potatoes for planting, would go a long way towards preventing the introduction of ring rot on a farm.

"Is complete eradication of ring rot in Canada possible?" Such a question may well be asked, and it is believed that this is still possible, but the longer an eradication program is put off the more difficult it will be. Eradication will always be cheaper than the losses caused by this disease. Even if complete eradication should not prove possible, this is what will have to be aimed at in order to control ring rot.

The Dominion Department of Agriculture is controlling ring rot in certified seed potatoes, thus assuring a supply of good seed, but it is the responsibility of the Provincial Departments of Agriculture to control it in table stock potatoes in their own province. This can be done by means of legislation, surveys, and direct assistance to farmers concerned. The provinces of Prince Edward Island, Ontario, Manitoba, Alberta, and British Columbia have plant diseases and pest acts, and some of these have special ring rot regulations which should be effectively enforced. The other provinces should pass similar disease and pest control legislation suitable for their own conditions, and lose no further time in controlling ring rot.

Difficulties in Controlling Ring Rot. The greatest difficulty encountered in controlling ring rot is its detection in trace infections. This is often rendered more difficult by insect injuries, late blight, and fungus wilts, and by wet weather when there may be little or no wilting of the plants. The easiest way of detecting ring rot is by following the digger at harvest time and watching for diseased potatoes, as practically every infected hill has some more or less rotted tubers. The next best time is when the potatoes are being graded after they have been in storage for about four weeks or more. Detection is even easier in the spring as, by then, more tubers have broken down. Culls should be examined carefully for ring rot.

The next difficulty is to prevent the infection of the potatoes on a farm where there is ring rot in the neighborhood. There are many ways in which infection may occur: The exchange or common use of machinery; carelessness of inspectors, prospective purchasers, or visitors who may cut diseased tubers on one farm and then cut healthy tubers on another without first washing or disinfecting their knives; the exchange of empty used bags for those that have been filled with the farmer's potatoes; getting a small quantity of potatoes from a neighbour to finish planting a field; indiscriminately bringing on the farm small lots of potatoes to "try something new," etc. Freedom from ring rot can only be assured by constant vigilance.

Information Needed. More information is required on whether or not the ring rot organism can overwinter or oversummer on machinery and bin walls. It is important that farmers disinfect all used jute bags left on their farms. In spring, summer and early fall this can conveniently be done by soaking them in formalin and hanging them on the fence to dry, but when the temperature falls below freezing this method is no longer practical. Therefore, the manner in which bags can be disinfected with formaldehyde gas under farm conditions in winter needs to be worked out. Information is also needed on a method of cleaning and disinfecting potato graders and on whether or not irrigation water can spread ring rot under ordinary farm practice.

Reports from the Provinces. Mr. R. R. Hurst stated that there had been a small amount of ring rot in Prince Edward Island at least since 1938, the total number of cases being 114 to date. However, the disease has been kept down by careful surveys in areas of outbreaks, disposition of infected potatoes to starch factories, disinfection of premises, and the planting of new certified seed potatoes. Growers have been warned against planting potatoes of unknown origin and using non-disinfected bags, and it is hoped that the disease will eventually be eradicated there.

Dr. D. J. MacLeod, reporting on New Brunswick, stated that there had been much ring rot there, but that the rapid decrease in the number of cases in certified seed potatoes was very gratifying. He said the control of ring rot in table stock potatoes had been slower, had lagged behind that in certified seed, but that recent progress promised that it would soon be satisfactory.

Discussing varietal reaction, he said that the Katahdin was very susceptible and the Green Mountain, Irish Cobbler and Chippewa, susceptible. The Sebago, although susceptible, was generally free. The President, formerly thought to be resistant, was practically a carrier, harbouring the disease without showing much evidence of infection. He mentioned also that some of the new Maine seedlings showed high resistance.

In Quebec, Mr. Perrault stated, ring rot was widespread although no accurate information was available except amongst certified seed growers. The percentage of fields entered for certification and rejected for ring rot was quite high, but the amount of ring rot was very small. In table stock potatoes the loss from ring rot was frequently quite high. The exchange of non-certified seed and of potato machinery amongst neighbours was chiefly responsible for the distribution of ring rot. The cost of certified seed discouraged many growers from changing their seed. In some cases the crop from certified seed became infected through lack of proper sanitation. Drastic measures should be taken to control ring rot, and these should include the establishment of ring rot-free areas in which only Foundation or Foundation A certified seed could be brought in.

Mr. H. N. Racicot, reporting on Ontario, outlined the ring rot regulations under the Plant Diseases Act, in which it is obligatory to dispose of infected potatoes where and when directed, clean and disinfect premises, and secure recommended seed. A survey in some of the chief potato growing districts had proved quite satisfactory, meeting with the enthusiastic support of the majority of the growers.

In Manitoba, it was reported by Dr. J. E. Machacek and Dr. W. A. F. Hagborg that the result of a preliminary survey for ring rot had proved quite disturbing; approximately 25 per cent of the commercial plantings in Central Manitoba had ring rot. The difficulty of recognizing the disease in its early stages, together with trace infection in some of the certified seed potatoes, had made its control more difficult. They recommended that a set-cutting inspection, involving the use of ultra-violet light and the Gram stain, be incorporated into the seed-increase plan, as a part of the tuber-indexing service.

Mr. Eaglesham, reporting on Alberta, stated that he could reiterate many of the statements made by Mr. C. Perrault. The large proportion of potato growers that are non-English speaking immigrants, their ignorance concerning the infectious nature of the disease, and trace infection in some of the seed used to replace diseased potatoes, are the main reasons for the increase of ring rot. He outlined the setting up of quarantine areas in which no potatoes can be moved about from one farm to another for planting purposes, and the attempts to prevent the transfer of machinery from

one farm to another. Growers were made to sterilize all second-hand bags before re-using them.

Dr. L. E. Tyner reported on an experiment which demonstrated that potato roots dipped into a suspension of the ring rot organism became infected, raising the question of infection through the soil if the bacteria are carried by irrigation water.

Mr. H. S. MacLeod reported two cases of ring rot in British Columbia in 1942 and described the control measures taken. In neither case did the disease recur in the following year. According to a report by Dr. W. Newton, British Columbia has maintained its relative freedom from ring rot by (1) wide publicity amongst the growers, (2) the inspection of all imported table stock potatoes, and the safe disposal of all lots found infected, and (3) the co-operation of all agricultural officials and growers, who reported every suspected case.

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SYMPOSIUM OF SEED-BORNE DISEASES

(Abstracts of Papers)

Chairman: T. C. VANTERPOOL
Section I — CEREALS
Leader of Discussion: F. J. GREANEY

SEED-BORNE DISEASES OF CEREALS IN CANADA — A SURVEY

F. J. GREANEY

During the four-year period 1939-1943, more than 4,000 samples of wheat, oats, and barley seed were collected from all parts of Canada and examined for the presence of parasites causing seed-borne diseases. Although most of the wheat samples examined carried spores of bunt or covered smut, only a few carried a spore load equivalent to, or heavier than, one part of smut to 128,000 parts of seed, by weight, and hence required seed treatment for smut control. On the other hand, a relatively large proportion of the oat and barley samples carried a load of surface-borne smut spores sufficiently heavy to necessitate seed treatment.

Plating tests of the seed showed that, among the numerous organisms isolated, species of **Helminthosporium** (**H. sativum** on wheat and barley; **H. avenae** on oats; and **H. teres** on barley) were the most important pathogens. Several species of **Fusarium** were commonly isolated, particularly from oat seed, but the pathological significance of most of these is still obscure. Infection tests in non-sterile soil demonstrated a high positive correlation between the percentage of seeds infected with **H. sativum** and **H. avenae** and the amount of disease in the subsequent seedlings. In wheat, but not in barley, seed infection with **H. sativum** was associated with low germination.

This preliminary survey showed that cereal seed infection with disease-producing fungi varied considerably from province to province, and from year to year, depending, of course, upon the conditions under which the seed was produced. It was also evident that some areas in Canada are more desirable for the production of disease-free seed of wheat, oats, and barley than are others. The results of the survey indicate that seed treatment, and every other means available, should be employed to prevent the inter-regional distribution of pathogenic seed-borne organisms in Canada. It was recommended that research work on all phases of the complex seed-borne disease problem be continued.

SOME OBSERVATIONS ON THE CEREAL SEED DISEASE SITUATION IN SASKATCHEWAN

P. M. SIMMONDS

The cereal seed disease situation in Saskatchewan was reviewed in the light of observations and work conducted at the Dominion Laboratory of Plant Pathology at Saskatoon. The seed disease problem from any angle is a large one, for in 1944 some 18,000,000 bushels of wheat seed were sown. The acreage sown to oats and barley, while smaller, still involved the handling of millions of bushels of seed. For good farm practice, all seed should be of strong germination, and either free from disease or treated for disease control. There are some facilities for seed germination and much publicity has been given to seed treatment methods, especially for smut control. There is still a troublesome amount of smut in the province, especially in oats and barley.

The influence of varieties must not be overlooked. In the early days, Red Fife—which is quite susceptible to bunt—was the common wheat grown. It was replaced by Marquis, a fairly smut-resistant wheat, which in turn has been replaced by

Thatcher, a somewhat susceptible variety again. The possibility of an increase in bunt must therefore be considered.

Seed treatment for smut control over the years has been greatly improved by the use of formalin, copper carbonate, and mercury dusts in place of the ineffective bluestone treatments formerly employed. Formalin solution and mercury dusts are most commonly used now.

The attitude of the farmers to seed treatment appears to have changed as smut in wheat decreased. When smut was a major problem, treatment was practised each year. This consistent treatment along with the introduction of Marquis wheat reduced the incidence of bunt to the extent that it is not readily found in the field, most seasons, in this province. Many farmers soon discovered that they could get clean crops without treatment. The tendency to omit seed treatment, a tedious chore, began to spread. The pathologist views this tendency with some concern.

It is our opinion that an annual seed examination service is not only the solution to this problem but will give us a complete view of the seed question from which future work may be planned. Some publicity directed towards the importance of seed diseases might have salutary results, to the extent that a grower will demand a seed examination for disease as well as the usual germination test. In Saskatchewan, one privately-owned laboratory has been offering a seed-examination service for a small fee. This laboratory has functioned now for four years with success, handling several thousand samples each season. We have tested many samples from their stock and found their recommendations to be reliable. The service seems to be well received by the farmers, and there have been no serious, if any, complaints. We think this type of service should be extended and properly controlled by government regulations.

METHODS OF APPLICATION OF DUST FUNGICIDES TO THE SEED OF CEREALS IN SASKATCHEWAN

H. W. MEAD

Descriptions of various types of automatic and power seed-treating machines were given. These included the Kemp Model 40 treater and the Roto-Grav, both of which are fully automatic. They make use of the weight of the seed for operation of a metering pan and fan wheel respectively, which in turn operate the dusting apparatus. The dust and grain fall over a series of baffles. By adding an electric motor, an elevator, and a bagger to the Model 40 Kemp treater and by enclosing it in a casing with suction fans, a small power unit suitable for seed-cleaning plants was created by the designer.

Home-made models, including the Minnesota treater, made of wood, a vertical gravity mixer, and a horizontal mixer of the cement-mixer type—both of which can be made out of steel drums—were described. With these, the dust is dispensed by hand.

It was shown, also, that seed grain could be dusted efficiently by turning it and the fungicide several times with a shovel.

The results of tests of coverage of wheat, oats, barley, and flax by several of these treaters and by the shovel method were given. They showed that the Kemp Model 40 automatic treater, and the same machine fitted with elevator and bagger, applied dust to 99 per cent of the seed and that coverage was even. The Roto-Grav automatic machine covered over 90 per cent but coverage was uneven. The Minnesota treater provided 78 per cent coverage, which was uneven. With the shovel method, 76, 86, and 100 per cent of the seeds were covered on the first, third, and fourth mixes, respectively.

Section II. — VEGETABLE SEED, FLAX, PEAS, SOYBEANS

Leader of Discussion: A. J. SKOLKO

SOME PROBLEMS ENCOUNTERED IN THE EXAMINATION OF PEAS AND FLAX FOR SEED-BORNE FUNGI

A. J. SKOLKO

As an introduction to the section on seed-borne diseases of vegetable and certain field crops, some examples derived from tests made at the Ottawa laboratory, illustrating the danger involved in the importation of diseased pea seeds, the present status of examinations of imported vegetable seed from the United States, and the effect of retting of flax on the amount of cracking in the seed, were presented.

SEED TREATMENT OF SOYBEANS

A. A. HILDEBRAND

Apart from physiological disorders soybeans are susceptible to attack by at least 32 diseases of a parasitic nature. Eleven of a reported total of 13 seed-borne diseases are known to occur in Canada. Certain of these, i.e., mosaic, pod and stem blight, and anthracnose are not amenable to successful control by surface-applied disinfectants, since infection is deep-seated in the cotyledonary tissues. In the case of certain others, however, i.e., downy mildew and brown spot, where the inoculum seems to be carried mostly on or close to the surface of the seed, control by seed treatment can apparently be highly effective. Recent experiments at Harrow ("randomized-block" plan, 5 replications) have shown that treatment of mildew-encrusted seed of the variety A. K. Harrow, with Spergon and with Arasan, not only increased emergence by over 10 per cent, as compared with untreated, mildew-infected seed, but also significantly reduced incidence of post-emergent disease among seedlings. While Spergon and Arasan were equally effective as control agents in the case of a single, specific disease, i.e., mildew, Spergon, nevertheless, was found to be markedly more effective than Arasan or Fermate under other circumstances. For example, when composite samples of 1942 A. K. Harrow commercial seed of known low viability and high disease potentiality were treated with Spergon, Arasan, and Fermate at the respective rates of 2, 1½, and 2 oz. per bu., percentage emergence of treated seed was as follows: Spergon 224.7; Arasan 87.3; and Fermate 77.0 (untreated check equals 100 per cent). Percentage incidence of post-emergent disease among seedlings in this experiment was as follows: Untreated check 22.2, Spergon 14.9, Arasan 22.5, and Fermate 21.6.

SEED-BORNE DISEASES — VEGETABLE SEED. NOTES ON SOIL TESTS AND SEED TREATMENTS

IRENE MOUNCE and J. E. BOSHER

One hundred seeds of each sample are planted, equally spaced, in flats of steam sterilized soil. The seedlings are kept until the first true leaves appear and any wilted ones are removed and the casual organism identified.

A summary of the results of four years tests was presented with emphasis on (a) the most troublesome diseases: **Alternaria radicina** on carrot, **Alternaria** wilt of **Brassica** spp. and **Phoma Betae** on mangel, garden beet, etc., (b) seed treatments, particularly the co-operative ones run by a committee of the American Phytopathological Society, (c) the interrelation of weather conditions and the amount of seed-borne disease in a crop and (d) a comparison of the per cent germination in soil tests with the official one obtained by the Plant Products Laboratory.

SEED-BORNE FUNGI

J. WALTON GROVES

During the past five years, samples of seed of between fifty and sixty agricultural plants have been examined for the presence of seed-borne fungi by means of the plating method. About one hundred and twenty-five species of fungi have been identified, of which many have not been reported previously as seed-borne. This paper is a general survey of these fungi from the point of view of host range and frequency of occurrence.

Some fungi, usually pathogenic species, have been isolated only from one kind of seed while other pathogenic species are less restricted in their host range. Many apparently saprophytic fungi have been isolated, and of these, some occur frequently on a wide variety of hosts and others appear only rarely.

FLAX SEED PROBLEMS IN SASKATCHEWAN

T. C. VANTERPOOL

With the increase in acreage of linseed flax on the Prairies, brought about by the war, and the improved moisture conditions of recent years, the problem of seed-borne diseases of flax has become serious in many scattered areas of Saskatchewan. Of these, stem break and browning (**Polyspora lini**) is the most serious. The other diseases are kept down to a minimum by growing resistant varieties or they are present in traces only. Pasmo (**Sphaerella linorum**) has not yet been recorded on flax in Sasketchewan.

It is not uncommon for 30 to 40 per cent of the flax-seed samples examined in any one year to be infested with **Polyspora lini.** In addition, the majority of these samples show a high percentage of seed-coat cracking. While seed disinfection with New Improved Ceresan practically counteracts the ill effects of cracking, it will not entirely prevent **Polyspora lini** from appearing in the crop grown from infested seed. What is needed at present is a greater realization by growers of the importance of the seed-borne diseases of flax, the adoption of seed disinfection with Ceresan of all seed used for sowing, the search for a more specific seed disinfectant for the stem-break and browning disease, some changes in the official regulations governing the production of registered and other high-grade seed and, finally, the search for disease-resistant varieties.

SYMPOSIUM ON VIRUS DISEASES OF TREE FRUITS

Chairman: D. L. BAILEY

Leader of Discussion: G. H. BERKELEY

VIRUS DISEASES OF STONE FRUITS IN ONTARIO

G. H. BERKELEY and R. S. WILLISON

In recent years many new virus diseases have been found on stone fruits. For example, in Ontario, where only two virus diseases, peach yellows and little peach, were known in 1935, at least fifteen are recognized today on peaches, plums or cherries. Fortunately, except for X disease of peaches, yellows and necrotic ring spot of sour cherries, and prune dwarf, the newer ones do not appear to be of a serious type.

Experience has shown that the first essentials in studying the viroses of tree fruits are (1) one or more varieties suitable for indexing purposes, (2) virus free stocks of known varieties and (3) a differential host range.

So far as is known the peach, either seedling or named variety, does not carry latent viroses and, moreover, reacts on the whole in a specific manner for any one virus. Hence peach has usually been used for indexing. Cherry and plum varieties from nursery stock are of little use in this respect, since there is no assurance that they are free from virus. For instance, when ninety one-year old apparently healthy Montmorency cherry trees from three different nurseries were indexed by budding on to peach, sixty-six were found to be carrying a latent virus, which caused dwarfing, mottling, bark necrosis and die-back on peach. A virus somewhat similar in its effects is latent in some Lombard plums. Sweet cherries are also able to mask at least one virus that can be transmitted to peach; while diseases such as peach yellows, little peach, line-pattern and prune dwarf are symptomless or nearly so on many plum varieties. These examples clearly show the necessity of establishing sources of healthy stock both for commercial propagation and for virus investigations. We have made a start in this direction by indexing a number of cherry and plum varieties and selecting healthy strains for further propagation.

The host range used at St. Catherines consists of Italian prune, Lombard plum, Elberta and Rochester peach, Black Tartarian and Napoleon sweet cherry and Montmorency sour cherry. It is our aim to transfer to this host range all the virus diseases encountered on stone fruits. To date fourteen viroses or suspects have been tested with very interesting results. For example, two viruses originally found on sweet cherry, varieties Eagle and Elkhorn, were shown to be strains of the prune dwarf virus. The symptom reaction of the host range to the cherry yellows complex indicates that this is closely related to prune dwarf since both produce small, rough-surfaced, strap-shaped leaves on Italian prune and Lombard plum, and pronounced dwarfing and loose rosetting on peach with some mottling especially on Elberta. On Black Tartarian and Napoleon both viruses induce faint to pronounced mottling with rings. Some definite cherry yellows symptoms have been secured on Montmorency, by budding, with cherry yellows virus but not so far with prune dwarf.

We have also found **Prunus myrobolan, P. mahaleb**, and peach seedlings very useful for the "double-budding" technique in which a diseased bud and a healthy bud of the desired test variety are inserted in the same seedling. This technique has several advantages such as conservation of space, early appearance of symptoms, the use of indexed clonal healthy stock, and simplification of indexing. Peach, apricot, and most plum varieties can be grown on peach seedlings, but **P. myrobolan** has been generally used for plums and **P. mahaleb** for cherries.

In addition to the experimental aspects, some attention has been given to orchard surveys for the purpose of following symptom expression, rate of spread and effect on crop over a period of years.

VIRUS DISEASES OF APPLE TREES

J. F. HOCKEY

There are two virus diseases of apple known as apple mosaic and false sting respectively. More information is desirable on their host range, effect on the crop and transmissibility. In the meantime, care in the selection of scions and stocks for grafting, and the roguing of trees when necessary, should keep both these diseases under control.

Other systemic conditions affecting the apple are mentioned as requiring further investigation—pale mottling of the foliage, vein clearing of the foliage, flat limb, russeting of smooth skinned varieties of fruits, severe cracking of fruit.

VIRUS DISEASES OF TREE FRUITS IN THE INTERIOR OF BRITISH COLUMBIA

T. B. LOTT

Systematic examinations of orchards in the Okanagan valley were commenced in 1938 to determine the extent to which virus and similar-appearing diseases were present. Experimental work has been directed to determine the nature of the diseases. Crinkle has caused greater losses to cherry growers than any of the virus diseases. Mottle leaf of Bing and Royal Anne, twisted leaf of Bing, and rasp leaf of several varieties have all been occasionally observed. A new transmissible disease 'Lambert mottle' was described. Prune dwarf has been found, but only in two trees. Apricot ring spot has occurred in a few orchards. Western X- disease of peach was found in a single tree in 1939. In surveys in 1940 the disease was found to be present in most of the orchards in the south end of the valley but only two trees were found elsewhere. In mapped orchards the disease has spread slowly in the southern districts but has not reappeared further north. In individual trees the development of the disease has been very irregular. In the study of little cherry in the Kootenay district, the Summerland Laboratory is co-operating with the province of British Columbia to repeat on a larger scale the work done by W. R. Foster. In pome fruits mosaic and flat limb of apple, and stony pit of pear have been observed in a few orchards.

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